The Mean and Extreme Daily TEMPERATURES in St. Louis for 47 Years,
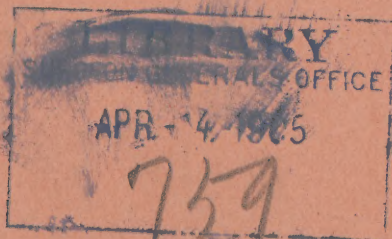
AS CALCULATED BY DAILY OBSERVATIONS.
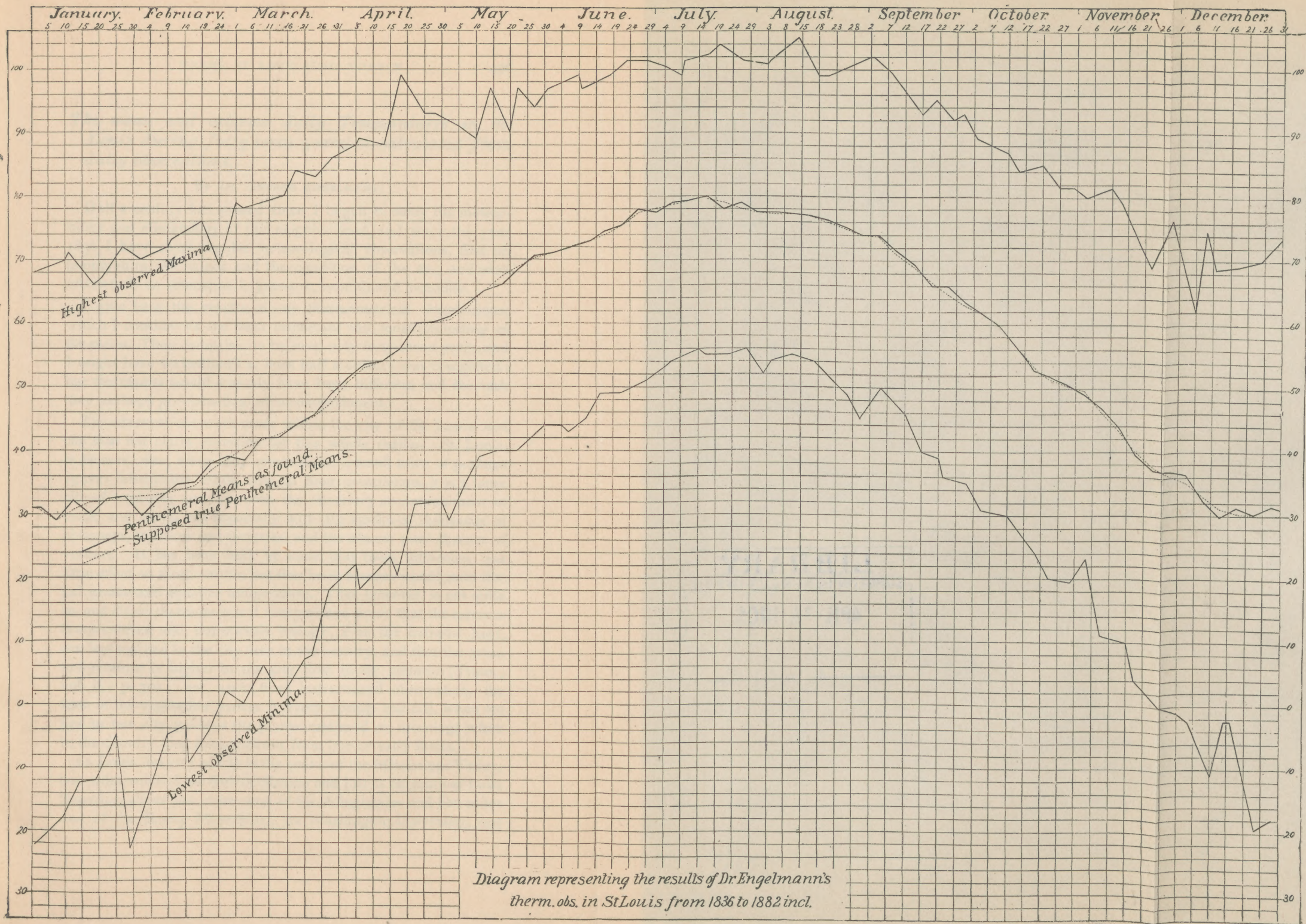
By DR. GEORGE ENGELMANN.

Diagram representing the results of Dr. Engelmann's therm. obs. in St Louis from 1836 to 1882 incl.

The mean and extreme daily Temperatures in St. Louis during forty-seven years, as calculated from daily observations,

By Dr. George Engelmann.

Half a century has passed since I began to study the meteorology and climatology of this neighborhood, and since the year 1836 I have made regular meteorological observations, first on temperature, the winds and the condition of the sky, and soon afterwards on atmospheric pressure, rainfall and humidity.

I give here the results of my thermometrical observations, which I consider as the most important and most interesting of the series. They comprise, to be sure, only forty-seven years, and I might have waited until at least half a century was completed; but the results would scarcely have been different, and the task then perhaps problematical of accomplishment.

The observations were made within the city of St. Louis, and can thus not claim precision for this whole region. St. Louis, to be sure, was, when they commenced, a small town of perhaps 15,000 inhabitants, while now, at their completion, it is a large city of probably 400,000, with the necessary accompaniment of brick and stone, and especially with the smoke of thousands of chimneys, furnaces and factories, and the almost total absence of verdure. It has been held by some, that these influences had little effect on temperature, but that brisk breezes would soon dispel smoke and equalize temperature. This, however, is not quite so, and direct thermometrical comparisons prove that the extreme temperatures, and, remarkably enough, even the extreme heat, are less marked in the city than in the country, and that the mean temperature is higher in the city than in the country (Trans., vol. ii., p. 70); but, aside from instrumental observation, the state of the vegetation proves it every spring and fall, when we find in our city gardens the plants uninjured on mornings when in the country they have suffered from late or early frosts.

St. Louis lies very nearly in the centre of the Mississippi Valley, 600 miles north of the Gulf of Mexico and just as far south of Lake Superior, about 500 miles west of the Alleghanies and 800 miles east of the Rocky Mountains; its Washington University, one

mile west of the river, lies in Lat. 38° 38′ 03″ and Long. 90° 12′ 15″; the low-water mark of the Mississippi is 379 feet above the Gulf, and the foot of Market street (City Directrix) is 413 feet above the same.

My observations were made in the first twelve years on the south-east corner of Second and Chestnut streets, only two blocks from the river and 75 feet above low-water mark of 1863 ; for the next 22 years on the south-west corner of Fifth and Elm streets, five blocks from the river and 110 feet above low-water mark ; and for the last 13 years on the north-west corner of Thirtieth and Locust streets, two miles from the river and 177 feet above low-water mark.   When I was absent from the city Dr. A. Wislizenus and lately Mr. B. D. Kribben have kindly filled the gaps.

My instruments were at first such as could then be obtained here ; soon I imported correct thermometers from Europe, and for nearly 40 years I used those made by Jas. Green, then of Baltimore, and soon afterwards of New York.

For many years the observations were made at different periods of the day, and especially at hours when the extremes might be expected to occur, viz. at sunrise and at 3 P.M. ; and the maximums and minimums were selected from all of them, often eight in a day, at whatever hour of the day they were found.   Differential thermometers were observed only since the last 12 years. Thus I may not always have noted the absolute extremes of each day, and my tables can claim only approximate reliability ; I give them for what they may be worth, but I can assure my readers that they furnish a record elaborated with zeal, conscientiousness, care and assiduity, and for a length of time such as probably few others, if any, exist in this valley.

The arrangement of the tables explains itself.   The first two columns represent the means of the 47 minimum and of the 47 maximum observations made on each day of the year, and the third column the mean calculated from the two former.   The next "Min." column gives the lowest and the "Max." column the highest temperature ever observed on that day ; the column of years next to these gives the year in which these extremes did occur. The last column represents a supposed—or estimated—true mean for the day after eliminating excessive extremes.

The year has been divided into 73 periods of 5 days each, the

means of which are printed in full-face type, to distinguish them. It will be seen, however, that the means of these periods do not progress, rise and fall, much more evenly than the single daily means; compare, e.g., the mean of Jan. 31st to Feb. 4th, which is so much lower than the mean of the foregoing or the following five days that one might suspect a regular and normal decline of temperature in these days, and not a mere accident.

A few facts must strike every one who examines the tables. The first is, that a time even as long as 47 years fails to give us anything approaching absolute and reliable means; and we come to the painful conclusion, that observations even continued for double that time, or for a century, may not yet obtain that desirable object. It seems that the excessive extremes of one or of a few days such as we often observe in our climate of extremes, especially in the winter season, will influence—or, I may say, vitiate—the means of a long series of observations; and the question with me arises, whether such extremes ought not to be eliminated from the series, and thus truer means be obtained. At the same time we may justly be astonished that from such heterogeneous data so much order and system result—which gives us hope that we cannot be quite on the wrong track.

Another fact, which strikes us in looking over the tables, is that the mean temperatures do not increase and decrease evenly, but sometimes quite rapidly, and at other times they may become almost stationary for a time. These points come out most strikingly on a diagram which embodies the essential parts of the results and shows the daily progress of the temperature. Thus we find very little change from the middle of December to the first part of February, though the temperature proves to be lowest from January 4th to 13th; then we notice a rapid rise from Feb. 6th to 20th, a slower rise to the middle of March, then a rapid one to the end of the month; in the forepart of April a slow and after the middle of that month a very marked one; then follows a tolerably even, at last quite slow, rise to July 9th, when between this date and the 18th the greatest elevation of the curve is obtained. After that the mean temperature falls slowly to the middle of August, followed by a more rapid decline to the end of September; after a slight pause in the first week in October, a more rapid fall takes place for the following two weeks and a

slighter one in the two weeks succeeding them. After that the temperature sinks rapidly to about Dec. 10th, from which time till the beginning of February the changes are not very marked.

The mean temperature of April 17th to 19th and from October 12th to 17th correspond with the mean of the year.

The tables, and still more distinctly the diagram, show us also that the extreme highest and lowest temperatures diverge most in winter and least in summer, and that their values are much more variable in the former than in the latter season. The possibilities of range from the middle of December to the middle of March are 80 to 95 degrees, while in June and July they amount only to 40 or 45 degrees.

The same law is found when we compare the actually observed lowest minimum and highest maximum of every month; their divergence is greatest in January, and least, not much more than half, in July.

	Min.	Max.	Range.		Min.	Max.	Range.
January	—22.5	72.0	94.5	July	53.0	104.0	51.0
February	—15.0	76.0	91.0	August	45.0	104.0	59.0
March	0.0	86.0	86.0	September	35.0	102.0	67.0
April	18.0	99.0	81.0	October	19.5	91 0	71.5
May	29.0	97 5	68.5	November	— 0.5	81.5	82.0
June	43.0	101.5	58.5	December	—19.5	72.5	92.0

Nearly the reverse is the case—i.e. the range in winter is much smaller than that in summer—if we compare the difference of the average daily minima and maxima for each month:

January	13.27	April	18.29	July	18.24	October	18.00
February	14.72	May	18.77	August	17.75	November	14.06
March	16.40	June	18.14	September	19.05	December	11.97

The range, it will be seen, is, on the whole, least in the cooler and greatest in the warmer months of the year; but this difference is not due to the lower or higher temperatures of those months, for it will be seen that in December the range is the smallest (smaller than in January) and in September greatest (greater than in July). This variation in the range of maxima and minima is undoubtedly owing to the condition of the sky in the different months. Gloomy weather prevails in the beginning of winter, and a clear sky with abundant evaporation, and thus a reduction of night temperature, in the autumn. The little table can give us an indication of the prevailing weather in the different months. Thus the difference, and its cause, the clearness of

the sky, rises from December gradually till May, falls a little in June and July and more in August, rises to its highest point in September, is yet high in October and then falls rapidly till December, to rise again in January.

The temperature of our continental locality shows a great difference from that of the western coast of Europe ; as a convenient example we may refer to the temperature of London. Their winters are warmer from the latter part of November until the beginning of March, and their summers much cooler from this period to the latter third of November ; and the mean is much higher here.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Whole true year.
St. Louis..	31.8	35.4	43.7	56.2	66.3	74.7	79.2	76.8	69.0	56.1	42.8	33.4	55.4
London...	37.2	39.3	42.7	48.1	54.5	60.8	63.6	62.0	57.6	50.4	42.7	39.7	49.9
Difference.	+5.4	+3.9	—1.0	—8.1	—11.8	—13.9	—15.6	—14.8	—11.4	—5.7	—0.1	+6.3	—5.5

MEAN AND EXTREME TEMPERATURES IN ST. LOUIS FROM 1836 to 1882.

1836-1882	Mean Values for each Day.			Extreme Maxima and Minima observed on each Day of the Year.				Supposed true Mean.
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	Mean.
Jan. 1	23.55	36.77	30.16	—22.5	1864	68.0	1876	31.5
2	25.35	37.97	31.66	—13.0	1879	65.5	1855	31.3
3	25.54	38.55	32.04	—15.5	"	66.5	1874, 1880	31.0
4	23.95	35.82	29.88	— 6.0	"	63.5	1880	30.5
5	23.45	39.22	31.33	— 8.5	1864	62.0	1876	30.2
	24.36	**37.66**	**31.01**	**—13.1**		**65.1**		**30.9**
6	23.76	37.63	30.69	— 9.0	1879	64.0	1880	30.0
7	22.33	33.95	28.14	— 1.0	1881	64.0	1839	29.4
8	22.75	34.61	28.68	— 6.0	1877	68.0	1876	29.0
9	22.65	35.48	29.06	—18.0	1875	65.5	"	29.0
10	22.67	34.82	28.74	—11.0	1881	70.0	1839	29.5
	22.83	**35.29**	**29.06**	**— 9.0**		**66.3**		**29.4**
11	25.42	39.20	32.31	— 1.0	1881	71.0	1839	30.0
12	26.69	39.27	32.98	— 2.0	1852	65.0	1863	30.2
13	24.61	36.81	30.71	0.0	"	59.0	"	30.6
14	25.61	38.11	31.86	—12.5	1881	64.0	1848	31.0
15	26.71	39.67	33.19	— 2.5	1875	66.0	1847	31.4
	25.80	**38.61**	**32.21**	**— 6 0**		**65.0**		**30.6**
16	24.03	36.27	30.15	2.0	1841	63.0	1845	31.8
17	21.09	34.27	27.68	—11.0	"	64.0	1842	32.0
18	21.65	34.32	27.98	—12.5	1857	66.0	"	32.0
19	23.63	38.09	30.86	—12.0	1852	61.0	1843	32.0
20	27.83	39.54	33.68	— 1.5	1866	64.0	"	32.0
	23.64	**36.49**	**30.07**	**— 7.0**		**63.6**		**31.9**
21	25.97	38.79	32.38	— 3.0	1854	67.0	1843	32.0
22	23.84	39.19	31.52	— 2.5	1857	62.0	1858	32.0
23	24.63	38.36	31.49	0.0	1854	62.0	1864	32.0
24	25.57	39.64	32.60	2.0	1873	65.0	1860	32.2
25	27.26	41.63	34.44	— 5.5	1840	65.0	1864	32.4
	25.45	**39.52**	**32.48**	**— 1.8**		**64.2**		**32.1**

1836-1882	Mean Value for each Day.			Extreme Maxima and Minima observed on each Day of the Year.				Supposed true Mean
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
Jan. 26	26.76	40.36	33.56	1.0	1865	71.5	1843	32.6
27	26.96	39.53	33.24	— 0.5	1873	72.0	1864	32.6
28	24.85	39.15	32.00	— 6.5	"	67.0	"	32.7
29	25.32	39 30	32.31	—23.0	"	64.5	1852	32.8
30	24.79	41.09	32.94	— 2.0	1856	64.5	1842	32.8
	25.73	**39.88**	**32.81**	**— 6.2**		**67.8**		**32.7**
31	24.96	38.20	31.58	2.0	1875	65.5	1877	32.8
Feb. 1	23.32	37.20	30.26	— 8.5	1836	70.0	1854	32.8
2	23.55	35.77	29.66	— 3.5	1873	56.0	1846	32.9
3	21.71	35.72	28.72	—15.0	1856	62.5	1852	32.9
4	22.01	36.51	29.26	—11.0	"	61.0	1837	33.0
	23.11	**36.68**	**29.89**	**— 7.2**		**63.0**		**32.9**
5	24.67	39.29	31.98	— 3.5	1856	61.0	1837	33.0
6	26.00	41 04	33.52	3.0	1843	67.0	1855	33.1
7	26.08	41.19	33.63	— 3.5	1872, 1875	65.0	1851	33.1
8	24.74	39.98	32.36	2.0	1842	66.0	1847	33.2
9	24.37	40.05	32.21	— 5.0	1875	72.0	1876	33.3
	25.17	**40.31**	**32.47**	**— 1.4**		**66.2**		**33.1**
10	25.92	41.56	33.74	1.0	1841	73.0	1876	33.5
11	29.98	43.93	36.95	2.0	"	73.0	1845	33.7
12	29.00	43.44	36.22	2.0	"	70.5	1882	33.9
13	29.06	40.41	34.73	4.5	1838	69.0	1867	34.0
14	24.71	39.38	32.04	— 3.5	1866	64.0	1857	34.1
	27.73	**41.74**	**34.73**	**1.2**		**69.9**		**33.8**
15	26.53	41.09	33.81	— 9.5	1866	68.0	1848	34.2
16	26.07	42.59	34.33	— 5.0	"	63.5	1857	34.4
17	28.03	41.18	34.60	— 4.0	1838	74.5	"	34.6
18	28.05	42.39	35.22	— 2.5	1849	65.5	1873	34.8
19	30.26	44.57	37.41	5.0	1838	76.0	1859	35.0
	27.79	**42.36**	**35.07**	**— 3.2**		**69.5**		**34.6**
20	31.83	45.80	38.81	— 3.5	1870	68.5	1850	35.5
21	30.33	45.27	37.80	— 4.5	1838	68.0	1836	36.0
22	31.82	46.97	39.39	1.5	1858	68.5	1861	36.5
23	30.11	44.71	37.41	0.0	"	69.5	1851	37.0
24	29.38	45.91	37.64	6.0	1873	69.0	1880	37.5
	30.69	**45.73**	**38.21**	**— 0.1**		**68.7**		**36.5**
25	31.02	46.05	38.53	7.0	1855	67.0	1876	38.0
26	31.68	48.91	40.29	2.0	1846	68.5	1880	38.5
27	30.58	45.46	38.02	5.0	1836	73.5	1876	38.7
28	30.47	47.02	38.74	10.5	1836, 1869	74.0	1861	39.0
Mar. 1	32.35	49.02	40.68	10.0	1843	79.5	"	39.2
	31.22	**47.29**	**39.25**	**6.9**		**72.5**		**38.7**
2	31.36	45.97	38.66	8.0	1843	76.0	1861	39.8
3	29.29	43.89	36.59	0.0	1848	78.0	1842	40.0
4	29.50	44.54	37.02	6.0	1875	75.5	1882	40.5
5	30.62	47.38	39.00	8.0	1848	71.0	1855	40.8
6	34.94	49.20	42.07	4.5	1869	76.5	1860	41.0
	31.14	**46.19**	**38.67**	**5.3**		**75.4**		**40.4**
7	34.88	51.60	43.24	10.5	1857	77.0	1853, 1879	41.2
8	34.49	50.31	42.40	13.5	1875	77.0	1879	41.4
9	35.01	48.18	41.59	6.0	1877	78.5	1842	41.6
10	33.22	49.52	41.37	10.0	1856	79.5	1279	41.8
11	34.55	49.67	42.11	7.0	1836	69.0	1848	42.0
	34.43	**49.85**	**42.14**	**7.4**		**76.0**		**41.6**

1836-1882	Mean Value for each Day.			Extreme Maxima and Minima observed for each Day of the Year.				Sup-posed true Mean
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
Mar 12	34.82	50.86	42.84	11.5	1836, 1857	71.0	1839, 1861	42.2
13	34.24	50.64	42.44	5.0	1867	75.0	1850	42.4
14	34.51	50.55	42.53	1.0	"	76.5	1875	42.5
15	33.87	48.89	41.38	7.5	1870	80.5	1854	42.6
16	34.14	50.03	42.08	9.0	1843	77.5	1868	42.8
	34.31	50.19	42.25	6.8		76.1		42.5
17	33.49	52.07	42.78	10.5	1879	79.0	1842	43.0
18	34.86	52.32	43.59	15.0	"	84.0	"	43.5
19	36.09	54.82	45.45	18.5	1875	84.0	"	44.0
20	36.91	52.52	44.71	14.0	1855	84.0	"	44.5
21	34.21	50.68	42.44	7.0	1876	76.0	1878	44.8
	35.11	52.48	43.79	13.0		81.4		43.9
22	35.56	54.04	44.80	13.0	1843	76.0	1857	45.0
23	37.09	55.48	46.28	7.5	"	82.5	1868	45.2
24	36.90	54.30	45.60	12.0	"	83.0	1842	45.4
25	37.21	53.76	45.48	13.0	"	82.5	1852	45.6
26	37.69	54.92	46.30	13.5	1873	78.5	1838	46.0
	36.89	54.50	45.69	11.8		80.5		45.4
27	39.16	56.81	47.98	23.5	1850	85.0	1838	46.5
28	39.77	57.31	48.54	18.0	1855	83.5	1879	47.0
29	40.42	58.31	49.36	23.5	1876	86.0	1842	47.5
30	41.07	57.91	49.49	28.0	"	84.0	1838	48.0
31	40.35	57.34	48.84	25.5	1856	84.0	"	48.5
	40.15	57.53	48.84	23.7		84.5		47.5
Apr. 1	39.70	57.25	48.47	24.0	1881	81.5	1882	49.5
2	40.92	61.12	51.02	24.0	"	85.0	"	50.0
3	44.66	62.44	53.55	24.5	1879	86.0	"	51.0
4	44.00	59.67	51.83	23.0	"	85.0	"	51.5
5	42.79	60.82	51.80	22.5	1857	88.5	1871	52.0
	42.41	60.26	51.33	23.6		85.2		50.8
6	43.61	62.89	53.25	18.0	1857	89.0	1871	52.5
7	44.77	63.98	54.37	29.0	1880	85.5	1860	53.0
8	45.59	60.96	53.28	24.0	1845	82.5	1836	53.0
9	43.84	61.86	52.85	27.0	1857	84.0	1844	53.2
10	45.07	61.94	53.50	28.5	1836, 1874	87.0	"	53.4
	44.57	62.33	53.45	25.3		85.6		53.0
11	43.81	62.53	53.17	27.0	1857	83.0	1842	53.6
12	45.35	62.44	53.89	26.0	"	84.0	1856	53.8
13	45.33	63.59	54.46	32.0	"	88.0	1845	54.0
14	45.03	63.26	54.14	28.5	"	84.0	"	54.2
15	44.52	62.02	53.27	23.0	1850	82.0	1856	54.4
	44.81	62.77	53.79	27.3		84.2		54.0
16	45.62	62.26	53.94	26.5	1875	91.0	1845	54.6
17	45.11	64.55	54.83	20.5	"	93.0	1855	55.0
18	45.78	64.34	55.06	26.0	"	99.0	"	56.0
19	47.20	66.47	56.83	29.0	1857	83.0	1847	57.0
20	48.47	67.92	58.19	34.0	"	85.0	1836	58.0
	46.43	65.11	55.77	27.2		90.2		56.1
21	49.76	69.01	59.38	36.0	1857, 1875	85.0	1867	59.0
22	51.37	69.70	60.53	31.5	1875	87.5	1842	60.0
23	49.88	69.90	59.89	31.5	1865	87.0	1842, 1854	60.0
24	50.24	68.92	59.58	34.0	1874	88.5	1854	60.0
25	51.89	70.82	61.35	33.5	1874, 1875	93.0	1843, 1855	60.0
	50.63	69.67	60.15	33.3		88.2		59.8

1836 1882	Mean Values for each Day.			Extreme Maxima and Minima observed on each Day of the Year.				Supposed true Mean
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
Ap. 26	51.20	70.53	60.86	33.5	1873	88.0	1872	60.0
27	50.63	69.98	60.30	37.0	1857	93.0	1838	60.0
28	51.21	68.71	59.96	34.0	1854	83.5	1845	60.0
29	50.87	69.15	60.01	33.0	1874	89.5	"	60.0
30	50.68	69.07	59.87	32.0	1877	92.5	1855	60.0
	50.92	**69.49**	**60.20**	**33.9**		**89.3**		**60.0**
May 1	50.53	69.72	60.12	35.5	1877	91.5	1836	60.0
2	51.06	68.34	59.70	29.0	1851	87.0	"	60.2
3	51.05	69.67	60.36	38.0	1841	88.5	1849	60.4
4	53.60	71.04	62.32	37.0	1877	89.0	1860	61.0
5	53.72	71.88	62.80	37.0	1851	91.5	"	61.4
	51.99	**70.13**	**61.06**	**35.3**		**89.5**		**60.6**
6	52.85	71.47	62.16	37.5	1863	88.0	1872	61.8
7	53.77	73 49	63.63	35.0	1867	88.0	"	62.0
8	54.05	72.56	63.30	38.0	1855	.88.0	"	62.5
9	54.40	73.21	63.80	39.0	"	88.0	"	63.0
10	53.37	73.16	63.26	40.0	1838, 1871	89.5	1844, 1863	63.5
	53.68	**72.78**	**63.23**	**37.9**		**88.3**		**62.5**
11	54.12	72.78	63.45	39.0	1864	91.5	1844	64.0
12	55.17	74.79	64.98	39.5	1857	91.5	1836	64.5
13	56.34	75.17	65.75	41.5	1878	90.0	1862	65.0
14	56.72	74.75	65.73	42.0	"	97.5	1836	65.5
15	55.61	75.53	65.57	40.5	"	93.0	"	66.0
	55.59	**74.60**	**65.05**	**40.5**		**92.7**		**65.0**
16	56.73	75.52	66.12	40.0	1837, 1875	92.0	1851	66.5
17	56.01	73.47	64.74	42.0	1857	91.0	1853	67.0
18	55.19	75.27	65.23	42.0	"	87.0	1836, 1870	67.5
19	57.24	77.30	67.27	43.0	1853	89.5	1871	68.0
20	57.61	77.34	67.47	42.0	1852	90.5	1836	68.2
	56.55	**75.78**	**66.17**	**41.8**		**90.0**		**67.4**
21	58.76	76.31	67.53	43.0	1857	96.0	1870	68.4
22	58.53	78.02	68.27	40.0	1838	97.0	"	68.6
23	59.26	77.68	68.47	44.0	1867, 1876	90.0	1839, 1856	68.8
24	59.66	78.80	69.23	45.0	1851	92.5	1873, 1879	69.0
25	60.21	77.40	68.80	44.0	1845	93.0	1860	69.5
	59.28	**77.64**	**68.46**	**43.2**		**93.7**		**68.8**
26	60.46	81.00	70.73	48.0	1853	93.0	1860	70.0
27	60.33	79.37	69.85	48.0	"	94.0	1874	70.2
28	60.46	80.59	70.52	45.0	1838	91 0	1848, 1851	70.4
29	61.08	79.24	70.16	44.0	1866	91.0	1852, 1879	70.6
30	61.68	79.94	70.81	44.0	1845	90.0	1841, 1854	70.8
	60.80	**80.02**	**70.41**	**45.8**		**91.8**		**70.4**
31	62.14	79.25	70.69	52.0	1856	97.0	1871	71.0
June 1	61.49	79.78	70.63	49.0	1843	91.0	1845, 1852	71.0
2	62.39	80.70	71.54	49.0	1838	94.0	1852	71.2
3	62.44	80.12	71.28	47.5	1879	93.0	1856	71.4
4	62.05	79.06	70.55	44.0	1859	94.0	1841	71.6
	62.10	**79.78**	**70.94**	**49.3**		**93.8**		**71.2**
5	61.36	79.45	70.40	43.0	1839	93.0	1871	71.8
6	62.57	81.88	72.22	43.0	1838	93.0	1836, 1874	72.0
7	62.18	81.34	71.73	50.0	1854	95.0	1874	72.2
8	63.83	81.95	72.89	49.0	"	96.0	1836	72.4
9	63.62	81.18	72.40	51.5	1852, 1877	99.5	"	72.6
	62.71	**81.16**	**71.93**	**47.3**		**95.3**		**72.2**

1836-1882	Mean Values for each Day.			Extreme Maxima and Minima observed on each Day of the Year.				Supposed true Mean
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	Mean
Jun.10	62.65	81.90	72.27	46.5	1877	97.5	1836	72.8
11	61.90	79.38	70.64	45.0	1842	94.0	1841	73.0
12	63.32	81.59	72.45	50.0	1858	94.5	1853	73.2
13	64.87	83.82	74.34	50.0	"	94.5	"	73.4
14	65.01	83.84	74.42	51.0	1856	96.0	1879	73.6
	63.55	**82.10**	**72.82**	**48.5**		**95.3**		**73.2**
15	65.11	83.79	74.45	49.0	1869	96.5	1868	73.8
16	65.26	82.32	73.79	53.0	1841	98.5	"	74.0
17	65.56	82.60	74.08	51.5	1876	98.5	"	74.3
18	65.78	83.97	74.87	49.5	"	99.0	"	74.6
19	65.59	84.37	74.98	52.0	1866	96.0	1853, 1869	74.8
	65.46	**83.41**	**74.43**	**51.0**		**97.7**		**74.3**
20	65.92	83.96	74.94	52.0	1862	98.0	1861	75.0
21	65.57	83.52	74.54	49.0	1863	97.0	1853	75.3
22	65.64	85.82	75.73	50.0	1868	99.0	1871	75.6
23	67.06	84.58	75.82	53.0	"	101.5	"	76.0
24	66.91	85.11	76.01	55.5	1853	97.5	1870	76.5
	66.22	**84.60**	**75.41**	**51.9**		**98.6**		**75.7**
25	68.13	86.54	77.33	56.0	1852	98.0	1870, 1882	77.0
26	68.73	87.88	78.30	55.0	1865	98.5	1870	77.5
27	70.26	87.21	78.73	59.0	1836	97.0	1854	78.0
28	69.36	87.48	78.42	55.5	1866	100.0	1870	78.0
29	69.26	86.08	77.67	51.0	"	101.5	"	78.0
	69.15	**87.04**	**78.09**	**55.3**		**99.0**		**77.7**
30	69.23	86.95	78.09	56.0	1871	101.5	1870	78.0
July 1	68.39	85.91	77.16	54.0	1851	98.0	1854	78.0
2	68.06	85.60	76.83	54.0	1861	98.5	1858	78.0
3	68.42	87.10	77.76	56.0	1857	99.5	1856	78.1
4	68.71	87.89	78.30	53.0	1859	100.5	1868	78.2
	68.56	**86.69**	**77.62**	**54.6**		**99.6**		**78.1**
5	69.24	87.39	78.32	56.5	1882	98.5	1870	78.3
6	70.11	88.05	79.08	54.0	1842	97.0	1868	78.6
7	70.20	87.84	79.02	58.0	"	98.0	1874	79.0
8	70.55	87.97	79.26	58.0	1870	97.0	1854, 1879	79.0
9	71.05	89.15	80.10	57.0	1842	99.0	1858	79.2
	70.23	**88.08**	**79.15**	**56.7**		**97.9**		**78.8**
10	71.46	87.84	79.65	61.0	1836	101.5	1881	79.2
11	70.35	86.99	78.67	58.0	1854, 1873	100.0	1841	79.4
12	70.64	87.50	79.07	58.0	1863	100.0	"	79.4
13	69.99	88.61	79.30	57.0	1861	100.5	1862	79.6
14	70.69	88.66	79.67	56.5	1882	100.5	1868	79.6
	70.62	**87.92**	**79.27**	**58.1**		**100.5**		**79.4**
15	71.44	89.38	80.41	58.0	1842	100.0	1856	80.0
16	71.42	89.02	80.22	55.0	1863	100.0	1870	80.0
17	70.66	90.07	80.36	56.0	"	102.5	1856	80.0
18	70.77	88.73	79.75	58.0	1846	101.5	1868	79.6
19	70.44	87.70	79.07	58.0	1878	100.0	1854	79.4
	70.94	**88.98**	**79.96**	**57.0**		**100.8**		**79.8**
20	69.94	86.92	78.43	57.0	1873	100.5	1854, 1860	79.2
21	69.08	86.42	77.13	57.0	1869	104.0	1860	79.0
22	68.63	85.63	77.94	57.0	1864	101.5	1870	79.0
23	68.72	87.16	78.01	55.0	1861	98.5	"	79.0
24	69.01	87.86	78.43	56.0	"	101.0	"	78.8
	69.07	**86.79**	**77.93**	**56.4**		**101.1**		**79.0**

1836-1882	Mean Values for each Day.			Extreme Maxima and Minima observed on each Day of the Year.				Supposed true Mean
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
Jul. 25	70.24	88.38	79.31	59.0	1876	100.0	1870	78.6
26	70.73	88.27	79.50	58.0	1853	99.5	"	78.4
27	70.38	87.58	78.98	56.0	"	101.5	"	78 2
28	70.23	87.80	79.01	56.0	"	100.0	1838	78.0
29	70.58	87.58	79.08	61.0	1853, 1865	101.0	1854	78.0
	70.43	**87.92**	**79.17**	**58.0**		**100.4**		**78.2**
30	68.52	85.57	77.04	55.0	1847	101.0	1838	77.8
31	67.96	86.47	77.21	55.0	1849	100.0	1854	77.8
Aug. 1	68.38	87.33	77.85	52.0	1842	101.0	"	77.5
2	68.25	86.95	77.60	52.0	"	99.0	1861	77.5
3	68.61	86.59	77.60	55.0	"	101.0	"	77.5
	68.34	**86.58**	**77.46**	**53.8**		**100.4**		**77.6**
4	68.40	85.51	76.95	54.0	1880	101.5	1861	77.5
5	68.50	86.01	77.25	58.0	"	97.5	1858	77.5
6	68.97	87.18	78.07	58.0	1842	98.5	1838	77.5
7	69.11	87.07	78.09	57.5	1852	100.0	1861	77.4
8	68.96	87.09	78.02	56.0	1869	99.0	1850	77.4
	68.79	**86.57**	**77.68**	**56.7**		**99.3**		**77.4**
9	68.94	85.14	77.04	58.0	1879	104.0	1881	77.4
10	69.07	83.39	76.23	55.5	1882	98.0	"	77.4
11	69.37	86.44	77.90	57.0	"	100.5	"	77.4
12	68.38	86.47	77.42	56.0	1868	105.0	"	77.2
13	68.72	86.08	77.40	57.0	1860	101.5	1850	77.0
	68.89	**85.50**	**77.19**	**56.7**		**101.8**		**77.3**
14	68.49	85.30	76.89	56.5	1861	98.5	1857	77.0
15	68.52	85.39	76.95	59.5	"	97.0	1841	76.9
16	67.48	86.22	76.89	57.0	1866	96.0	1860	76.8
17	67.94	85.54	76.74	54.0	1855	97.0	1843, 1860	76.7
18	68.03	86.27	77.15	56.0	1855, 1866	99.5	1850	76.5
	68.09	**85.74**	**76.91**	**56.6**		**97.6**		**76.8**
19	68.19	85.25	76.72	56.0	1855	99.5	1850	76.4
20	66.88	85.72	76.30	52.0	1836	99.0	"	76.3
21	67.87	85.71	76.79	59.0	1864	97.0	1869	76.2
22	67.29	84.67	75.98	51.0	1837	97.5	1872	76.0
23	66.31	84.09	75.20	52.0	1866	97.5	1869	76.0
	67.31	**85.09**	**76.20**	**54.0**		**98.1**		**76.2**
24	66.63	85.29	75.96	49.0	1866	97.0	1872	75.8
25	66.38	84.42	75.40	50.5	"	100.0	"	75.5
26	67.02	84.94	75.98	49.0	1863	98.5	"	75.3
27	65.88	84.11	74.99	54.0	1856	97.5	1838	75.0
28	65.37	82.98	74.17	51.0	1844	97.5	1881	74.8
	66.25	**84.35**	**75.30**	**50.7**		**98.1**		**75.3**
29	64.80	83.05	73.92	49.0	1863	99.5	1881	74.5
30	64.55	84.34	74.44	45.0	"	100.5	1854	74.3
31	65.45	82.96	74.20	48.5	"	99.0	1854, 1873	74.2
Sept. 1	64.75	83.69	74.22	50.0	1849	98.5	1854	74.0
2	65.08	82.80	73.94	51.5	1850	102.0	1864	74.0
	64.93	**83.37**	**74.15**	**48.8**		**99.9**		**74.2**
3	64.54	83.00	73.77	51.0	1863	102.0	1864	74.0
4	65.10	83.59	74.34	51.0	1868	100.0	1881	74.0
5	65.33	82.15	73.74	50.0	1859	100.0	"	73.8
6	64.98	81.84	73.41	51.5	1848	97.0	"	73.6
7	65.61	83.17	74.39	52.0	1849	97.0	"	73.4
	65.11	**82.75**	**73.93**	**51.1**		**99.2**		**73.7**

1836-1882	Mean Values for each Day.			Extreme Maxima and Minima observed on each Day of the Year.				Supposed true Mean
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
Sept. 8	64.48	83.47	73.97	49.5	1849	99.5	1854	73.0
9	63.79	80.63	72.21	50.0	1847, 1869	93.5	1841	72.0
10	62.59	79.95	71.27	46.5	1880	96.5	1842	71.0
11	61.01	78.90	69.95	47.5	1878	94.0	"	70.2
12	60.69	77.79	69.24	46.0	1839, 1878	92.0	1865	70.0
	62.51	**80.15**	**71.33**	**47.9**		**95.1**		**71.2**
13	60.27	77.85	69.06	47.0	1839, 1878	93.0	1851, 1864	70.0
14	60.37	79.16	69.76	43.5	1873	93.0	1846	69.5
15	60.51	77.88	69.19	47.5	1880	88.0	1849, 1862	69.0
16	60.76	79.34	70.05	47.0	1842	91.5	1857	69.0
17	60.54	77.72	69.13	40.5	1868	93.0	1843, 1857	68.5
	60.49	**78.39**	**69.44**	**45.1**		**91.7**		**69.2**
18	60.08	78.29	69.18	42.0	1863	92.5	1867	68.0
19	57.74	75.91	66.82	44.5	"	92.0	"	67.0
20	55.76	73.68	64.72	39.0	1875	93.5	1881	66.0
21	55.50	73.29	64.39	39.5	1866	95.0	1872	66.0
22	55.39	73.69	64.54	39.0	1875	92.0	1881	65.8
	56.89	**74.96**	**65.93**	**40.8**		**93.0**		**66.5**
23	58.17	76.82	67.49	36.0	1856	92.0	1881	65.5
24	58.15	76.23	67.19	37.0	"	92.5	"	65.0
25	57.09	75.37	66.23	42.0	1879	91.5	1850	64.8
26	54.61	73.81	64.21	40.0	1875	92.0	1847	64.5
27	54.87	73.82	64.34	41.5	1871	88.0	1854	64.3
	56.58	**75.21**	**65.89**	**39.3**		**91.2**		**64.8**
28	54.37	73.53	63.95	36.0	1839	90.5	1867	64.0
29	54.17	71.87	63.02	35.5	1846	93.0	1858	63.5
30	52.59	71.53	62.06	35.0	1851	90.0	"	63.0
Oct. 1	54.64	73.37	64.00	36.5	1856	87.0	1856	63.0
2	54.68	73.74	64.21	38.5	"	91.0	1867	63.0
	54.09	**72.81**	**63.45**	**36.3**		**90.3**		**63.1**
3	54.52	73.55	64.03	33.0	1840	89.0	1872	62.5
4	52.29	70.59	61.44	31.0	1836	88.5	"	62.0
5	52.18	70.36	61.27	34.0	"	88.0	1879	61.5
6	52.52	70.03	61.27	34.0	1855	88.5	1852	61.5
7	51.93	70.62	61.27	34.0	1873	87.0	1860	61.0
	52.69	**71.03**	**61.86**	**33.2**		**88.2**		**61.7**
8	51.70	71.14	61.42	31.5	1868	85.0	1856	60.5
9	51.49	70.66	61.07	36.5	1842, 1864	87.0	1879	60.0
10	51.26	69.91	60.58	37.0	1849	86.0	"	59.5
11	49.98	67.14	58.56	31.5	1872	86.0	"	59.0
12	48.73	64.91	56.82	30.0	1875	87.0	"	58.5
	50.63	**68.75**	**59.69**	**33.1**		**86.2**		**59.5**
13	45.99	65.96	55.97	29.5	1860	81.5	1879	58.0
14	47.20	65.24	56.22	29.5	1872	84.0	1878	57.5
15	46.88	65.82	56.35	28.0	1845	84.5	1881	57.0
16	47.34	65.64	56.49	27.0	1838	83.0	1842	56.0
17	46.80	65.42	56.11	31.0	1836, 1868	83.0	1839, 1842	55.0
	46.84	**65.61**	**56.23**	**29.0**		**83.2**		**56.7**
18	44.64	60.55	52.59	34.5	1875	82.5	1867	54.5
19	42.70	61.62	52.16	30.0	1846	84.0	1837	54.0
20	42.75	62.31	52.53	24.0	1836	83.0	1843	53.5
21	44.60	62.47	53.53	25.0	"	84.0	1837	53.0
22	44.15	61.47	52.81	30.0	1869	85.0	"	52.5
	43.77	**61.68**	**52.72**	**28.7**		**83.7**		**53.5**

1836-1882	Mean Values for each Day.			Extreme Maxima and Minima observed on each Day of the Year.				Supposed true Mean
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	Mean
Oct. 23	43.41	61.54	52.47	20.0	1863	79.5	1839	52.0
24	44.32	60.64	52.48	20.0	"	78.0	1875	51.8
25	42.51	59.96	51.23	22.0	1841	78.5	1882	51.6
26	43.64	60.56	52.10	21.5	1862	81.5	1874	51.4
27	42.15	61.11	51.63	26.0	1869	81.5	1870	51.0
	43.20	**60.76**	**51.98**	**21.9**		**79.8**		**51.5**
28	43.54	60.56	52.05	27.0	1873, 1878	80.5	1874	51.0
29	43.71	60.77	52.24	22.0	1873	81.5	1875	50.5
30	42.34	57.28	49.81	26.5	1863	81.5	1876	50.5
31	39.75	56.66	48.20	19.5	"	80.0	"	50.0
Nov. 1	42.01	59.97	50.99	22.0	1873	78.0	1842, 1876	50.0
	42.27	**59.05**	**50.66**	**23.4**		**80.5**		**50.4**
2	43.20	58.00	50.60	30.5	1848	77.0	1847	50.0
3	41.11	56.59	48.85	25.5	1879	75.5	1859	49.8
4	42.01	58.66	50.33	23.0	"	80.0	1850	49.4
5	41.23	55.70	48.46	25.0	1865	72.5	1874	49.0
6	38.91	55.29	47.10	23.5	1877	73.0	1874, 1878	48.5
	41.29	**56.85**	**49.07**	**25.5**		**75.6**		**49.3**
7	40.78	57.55	49.16	24.0	1856	77.0	1874	48.0
8	40.30	55.78	48.04	11.0	1838	75.5	1868	47.0
9	37.43	51.88	44.66	16.0	"	75.0	1844	46.0
10	39.03	52.71	45.87	20.0	"	76.0	"	45.5
11	40.23	53.53	46.88	26.5	1869	81.5	1837	45.0
	39.55	**54.29**	**46.92**	**19.5**		**77.0**		**46.3**
12	36.93	51.66	44.29	17.0	1859	71.5	1879	44.5
13	36.66	52.82	44.74	15.0	"	79.0	"	44.0
14	36.67	51.86	44.26	20.0	1872	71.5	1855	43.5
15	35.18	50.01	42.59	18.0	1838	72.0	1873	43.0
16	36.11	49.60	42.85	10.0	"	69.0	1865	42.0
	36.31	**51.19**	**43.75**	**16.0**		**72.6**		**43.4**
17	35.55	47.80	41.67	12.0	1838	69.0	1853	41.0
18	33.62	45.58	39.60	6.0	1880	72.0	"	40.5
19	31.60	45.03	38.31	7.5	"	71.0	"	40.0
20	32.59	45.11	38.85	9.5	1872	72.5	1837	39.5
21	33.09	45.84	39.46	10.5	1880	69.0	1841	39.0
	33.29	**45.87**	**39.58**	**9.1**		**70.7**		**40.0**
22	32.28	45.92	39.10	6.5	1880	71.0	1843	38.5
23	32.14	43.97	38.05	9.5	1871	69.0	1867	38.0
24	29.85	41.93	35.89	5.5	1860	65.5	1850	37.8
25	29.83	41.92	35.87	0.0	1839	64.5	1856	37.6
26	31.25	44.06	37.65	14.0	"	65.0	1850	37.4
	31.07	**43.56**	**37.31**	**7.1**		**67.0**	.	**37.6**
27	31.44	43.22	37.33	5.0	1845	67.0	1870	37.0
28	31.64	44.05	37.84	− 0.5	"	72.0	1864	36.8
29	29.04	42.76	35.90	2.0	1872	76.5	"	36.4
30	28.55	42.98	35.76	6.5	1845	72.5	1837	36.0
Dec. 1	30.33	45.57	37.95	− 1.0	"	72.5	"	36.0
	30.20	**43.71**	**36.95**	**2.4**		**72.1**		**36.4**
2	31.06	44.95	38.00	4.0	1876	72.0	1864	35.8
3	30.61	43.00	36.80	8.0	1859	61.0	1842, 1873	35.6
4	30.75	42.18	36.46	− 2.5	1871	59.0	1877	35.4
5	29.45	41.33	35.39	2.5	"	61.0	1879	35.2
6	29.56	41.88	35.72	3.5	1859	62.0	1861	35.0
	30.28	**42.67**	**36.47**	**3.1**		**63.0**		**35.4**

1836-1882	Mean Values for each Day.			Extreme Maxima and Minima observed on each Day of the Year.				Sup- posed true Mean
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
Dec. 7	28.00	40.23	34.11	—11.0	1882	63.0	1851	34.0
8	27.79	39.11	33.49	— 4.0	"	65.0	1861	33.5
9	25.07	35.35	30.21	— 5.0	1876	74.5	"	33.0
10	23.89	36.06	29.97	0.0	1868	68.0	"	32.5
11	28.19	37.61	32.90	—11.0	"	68.0	1873	32.0
	26.59	**37.67**	**32.13**	**— 6.2**		**67.7**		**33.0**
12	25.54	37.15	31.34	— 0.5	1868	68.5	1877	31.8
13	26.25	36.70	31.47	4.0	1865	62.5	1881	31.6
14	23.46	33.79	28.62	— 1.0	"	59.0	1861	31.4
15	23.57	33.46	28.51	— 2.5	1851	67.5	1877	31.2
16	24.29	34.83	29.56	— 0.5	"	62.0	"	31.0
	24.62	**35.18**	**29.90**	**— 0.1**		**63.9**		**31.4**
17	25.10	36.91	31.00	— 2.5	1875	67.0	1877	31.0
18	25.76	38.87	32.31	1.0	1876	69.0	"	30.8
19	26.37	38 10	32.23	0.5	1863	67.5	"	30.6
20	23.51	35.84	29.67	— 2.0	1871	65.0	"	30.4
21	24.84	36.97	30.90	— 2.0	1865	66.0	"	30.0
	25.11	**37.34**	**31.22**	**— 1.0**		**66.9**		**30.5**
22	22.64	33.86	28.25	—14.0	1872	62.0	1877	30.0
23	22.51	35.34	28.92	— 7.0	1870	61.0	1875	30.2
24	23.90	36.62	30.26	—19.5	1872	66.0	"	30.5
25	25.42	37.95	31.68	—11.0	"	70.0	1867	31.0
26	25.63	38.06	31.84	— 5.0	"	65.0	1875	31.2
	24.02	**36.36**	**30.19**	**—11.3**		**64.8**		**30.6**
27	26.47	38.41	32.44	— 6.0	1872	65.0	1846	31.3
28	26.34	37.80	32.07	— 6.0	1880	59.0	1862	31.5
29	25.83	37.49	31.66	—18.0	"	64.0	1851	31.5
30	23.26	36.73	29.99	— 8.0	"	66.0	1875	31.5
31	24.25	38.43	31.34	—10.5	1863	73.5	"	31.5
	25.23	**37.77**	**31.50**	**— 9.7**		**65.5**		**31.5**

The annexed diagram, for the construction of which I am indebted to Dr. G. Hambach, represents the principal results of these tables. The perpendicular lines divide the year into 73 periods of 5 days each, while the horizontal ones mark the degrees. The central full-faced curve indicates the Mean Temperature of the penthemeral periods of the 47 years, as actually found, while the dotted line represents the supposed real Mean Temperature as suggested in the last column of these tables. The uppermost curve shows the Highest Temperatures and the lowest curve the Lowest Temperatures observed in those same penthemeral periods within the same number of years. It will be noticed that while the points of Mean Temperature occupy the centre of each period, the Maxima and Minima do not show in the middle of the spaces, but on that one of the 5 days of the period on which they actually did occur.